2 Claims

What we claim is:

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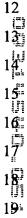
1. A composition comprising a biodegradable polymer having a ligand attached thereto, and wherein said ligand is attached to said biodegradable polymer using a biological recognition event.



**4**. A composition comprising a biomaterial Architecture having a ligand attached thereto through a biological recognition event, and wherein said biological recognition event is further characterized in that it involves an anchor-adapter-tag unit, whereby said anchor is attached to the biomaterial architecture and said tag is attached to the ligand, and said adapter is capable of binding to both the anchor and the tag to effect the biological recognition event.



3. The composition of claim 2, wherein said anchor-adapter-tag unit is a three-component system.



4. The composition of claim 2, wherein said anchor-adapter-tag unit is a two-component system, whereby the anchor and adapter functionalities are provided by one molecule capable of effecting interaction with the tag unit, and an anchor-tag system is generated.

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The composition of claim 2, wherein said anchor-adapter-tag unit is a two-component 5. system, whereby the adapter and tag functionalities are provided by one molecule capable of effecting interaction with the adapter unit, and an anchor-tag system is generated.



6. The composition of claim 2, wherein the anchor and tag independently comprise any biologically relevant molecule capable of being incorporated into the biomaterial architecture and

- the desired ligand, and wherein the adapter comprises any biologically relevant molecule capable 1 of binding to both the anchor and tag molecules to generate a biomolecular interaction. 2 3 7. The composition of claim 2, wherein said biomaterial architecture comprises a 4 5 biodegradable polymer. 6 The composition of claim 2, wherein said anchor is incorporated into the polymer during 8. polymer synthesis. The composition of claim 2, wherein said polymer is PLA-PEG. 9. 12 13 14 15 16 18 18 18 The composition of claim 2, wherein said biodegradable polymer is selected from the 10. group consisting of polymers of poly(hydroxy aoids), polyanhydrides, polyorthoesters, polyphosphazenes, polyphosphates, polycaprolactone, polyhydroxybutyrates, polyesters, polyamides, polysaccharides, polyproteins, copolymers or blends thereof. The composition of claim 2, wherein the anchor and tag comprise biotin and the adapter comprises avidin or streptavidin. The composition of claim 2, wherein the anchor and tag comprise the same or different 12. hapten, and the adapter comprises an antibody having the required specificity for the hapten(s). The composition of claim 2/wherein said ligand comprises a biologically relevant 13. compound selected from the group consisting of peptide, protein, carbohydrate, nucleic acid, lipid, polysaccharide, and combinations thereof. 25
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- 14. The composition of claim 4, wherein the tag comprises a hapten and the anchor
- comprises an antibody having the required specificity for the hapten.

1	15.	The composition of claim 4, wherein the anchor comprises avidin and the tag comprises
2	biotir	·1
3		
4	16.	The composition of claim 5, wherein the anchor comprises a hapten and the tag
5	comp	rises an antibody having the required specificity for the hapten.
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7	17.	The composition of claim 5, wherein the anchor comprises biotin and the tag comprises
8	avidir	<b>\</b>
9		`/
1805	)1,8.	A method for synthesizing a biomaterial architecture having an anchor associated
	therev	vith comprising:
12		providing a solution of a biodegradable polymeric material, wherein said polymeric
137	mater	ial is capable of having an anchor mojety associated therewith and wherein said polymeric
144	material has at least one functionality capable of further polymerization;	
12 13 14 15 16 17 18 19 20		contacting said solution with an anchor moiety capable of associating with said polymeric
16	materi	al; and
17		subjecting said polymeric material having an anchor associated therewith to conditions
187	capabl	e of effecting further polymerization at a desired functionality to yield a desired polymeric
1 <b>9</b> ≟	materi	al.
·==		
2 T	19.	The method of claim 18, wherein said biodegradable polymeric material comprises α-
22	amine	ω-hydroxy poly(ethylene glycol), and wherein this material having an anchor associated
23	therew	rith is further polymerized at the lactide functionality to generate a PLA (poly (lactic
24	acid))-	PEG block copolymer having an anchor associated therewith.
25		
26	20.	The method of claim 18 or 19, wherein said anchor moiety comprises biotin.
27		
28	21.	The method of claim 18 or 19, wherein-said anchor moiety comprises avidin.
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1	22.	The method of claim 18 or 19, wherein said anchor moiety comprises an antibody or
2	antibo	dy fragment.
3		
4	23.	The method of claim 18 or 19, wherein said anchor moiety comprises a hapten.
5		
6	2 <b>4</b> .	A method for the modification of a biomaterial architecture comprising:
7	•	providing a biomaterial architecture, having an anchor attached thereto or incorporated
8	therein	ı;
9		contacting said biomaterial-anchor moiety with an adapter moiety; and
10		contacting said biomaterial-anchor-adapter moiety with a desired ligand having a tag
11	incorp	orated therein to produce a biomaterial-anchor-adapter-tag-ligand moiety.
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	25.	The method of claim 24, wherein the anchor and tag independently comprise any
ON ON	biologi	cally relevant molecule capable of being incorporated into the biomaterial architecture and
15	the des	ired ligand, and wherein the adapter comprises any biologically relevant molecule capable
16	of bind	ing to both the anchor and tag moieties.
17		, \
15 16 17 18 19 19 19 19 19 19 19 19 19 19 19 19 19	26.	The method of claim 24, wherein said biomaterial architecture comprises a biodegradable
19-	polyme	r.
20		
21	27.	The method of claim 24 wherein said anchor is incorporated into the polymer during
22	polyme	r synthesis.
23		
24	28.	The method of claim 27, wherein said polymer is preferably PLA-PEG.
25		
26	29.	The method of claim 24, wherein said biodegradable polymer is selected from the group
27		ng of polymers of polyhydroxy acids, polyanhydrides, polyorthoesters,
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1	polyphosphazenes, polyphosphates, polycaprolactone, polyhydroxybutyrates, polyesters,
2	polyamides, polysaccharides, polyproteins, and copolymers and blends thereof.
3	
4	30. The method of claim 24, wherein the anchor and tag comprise biotin and the adapter
5	comprises avidin or streptavidin.
6	
7	31. The method of claim 24, wherein the anchor and tag comprise the same or different
8	hapten, and the adapter comprises an antibody having the required specificity for the hapten(s).
2	
( الألك	32. The method of claim 24, wherein said ligand comprises a biologically relevant compound
$\partial_1 \mu$	selected from the group consisting of peptide, protein, carbohydrate, nucleic acid, lipid,
12	polysaccharide, and combinations thereof.
13[]	•
14.	33. A method for the modification of a biomaterial architecture comprising:
15	providing a biomaterial architecture, having an anchor attached thereto or incorporated
16	therein; and
17	contacting said biomaterial-anchor moiety with a desired ligand having a tag incorporated
12 13 14 15 16 17 18	therein to produce a biomaterial-anchor-tag-ligand moiety.
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WE TO THE REAL PROPERTY OF THE	34. The method of claim 33, wherein the anchor and tag independently comprise any
DE L	biologically relevant molecule capable of being incorporated into the biomaterial architecture and
22	the desired ligand, and effecting a biomolecular interaction between the anchor and tag.
23	
24	35. The method of claim 33, wherein said biomaterial architecture comprises a biodegradable
25	polymer.
26	
27	36. The method of claim 33, wherein said anchor-is incorporated into the polymer during
28	polymer synthesis.
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1	37. The method of claim 36, wherein said polymer is preferably PLA-PEG.
2	
3	38. The method of claim 33, wherein said biodegradable polymer is selected from the group
4	consisting of polymers of polyhydroxy acids, polyanhydrides, polyorthoesters,
5	polyphosphazenes, polyphosphates, polycaprolactone, polyhydroxybutyrates, polyesters,
6	polyamides, polysaccharides, polyproteins, and copolymers and blends thereof.
7	
8	39. The method of claim 33, wherein the anchor comprises biotin and the tag comprises
9	avidin or streptavidin.
10	
11	The method of claim 33, wherein the anchor comprises avidin or streptavidin and the tag
12	comprises biotin.
132)	$X \setminus X$
14.	41. The method of claim 33, wherein the anchor comprises a hapten, and the tag comprises
12 130 141 151 161 17	an antibody having the required specificity for the hapten.
16	
	42. The method of claim 33, wherein the tag comprises a hapten, and the anchor comprises
18 19 19 19 19 19 19 19 19 19 19 19 19 19	an antibody having the required specificity for the hapten.
19	
20	43. The method of claim 33, wherein said ligand comprises a biologically relevant compound
2f /	selected from the group consisting of peptide, protein, carbohydrate, nucleic acid, lipid,
22	polysaccharide, and combinations thereof.
23	<b>\</b>
24	44. A method for tissue engineering comprising:
25	providing a scaffold having a biological ligand attached thereto, wherein said ligand is
26	attached by a biomolecular interaction;
27	contacting said scaffold with cells, wherein said cells interact specifically with the ligand
28	attached to the scaffold;
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1	promoting cell growth and/or differentiation to generate tissue; and
2	implanting said tissue.
3	implanting said tissue.
0 104	45. The method of claim 44, wherein said bigmolecular interaction is characterized in that it
( sp5	involves an anchor-adapter-tag unit, whereby said anchor is attached to the biomaterial
an <sub>6</sub>	architecture and said tag is attached to the ligand, and said adapter is capable of binding to both
7	the anchor and the tag.
8	
9 .	46. The method of claim 44, wherein the anchor and tag independently comprise any
10	biologically relevant molecule capable of being incorporated into the biomaterial architecture and
11	the desired ligand, and wherein the adapter comprises any biologically relevant molecule capable
12	of binding to both the anchor and tag moieties to generate a biomolecular interaction.
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14.	47. The method of claim 44, wherein said biomolecular interaction is characterized in that it
15	involves an anchor-tag unit, whereby said anchor is attached to the biomaterial architecture and
16	said tag is attached to the ligand and wherein either the anchor or the tag is capable of effecting a
12 13 14 15 16 17	biomolecular interaction between the anchor and the tag.
18	
Cultural )	48. The method of claim 47, wherein the anchor and tag comprise any biologically relevant
20	molecule capable of being incorporated into the biomaterial architecture and the desired ligand,
2 T	and wherein a biomolecular interaction is effected between the anchor and the tag.
22	1
23	49. The method of claim 44, wherein said scaffold comprises a biodegradable polymer.
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25	50. The method of claim 45 or 47, wherein said anchor is incorporated into the polymer
26	during polymer synthesis.
27	
28	51. The method of claim 50, wherein said polymer is PLA PEG.
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1	52. The method of claim 44 wherein promoting cell growth and/or differentiation comprises
2	seeding cells in a bioreactor
3	
4	53. The method of claim 44, wherein implanting said tissue comprises implanting tissue still
5	attached to the scaffold.
6	
7	54. The method of claim 44, wherein implanting said tissue comprises degrading the scaffold
8	and implanting the tissue without the scaffold.
9	\
10	56. A method for site specific delivery of therapeutic agents comprising:
11	providing a composition further comprising:
12	a biomaterial architecture, wherein said architecture has a biological ligand
13	attached thereto by a biomolecular interaction, and
14.	a therapeutic agent associated therewith; and
15	contacting said composition with cells, wherein the ligand attached to the biomaterial
16	architecture interacts with the cells to effect site specific delivery of the therapeutic agent to the
17	cells.
18	$/\omega$
12 13 14 15 16 17 18 19 19 19 19 19 19 19 19 19 19 19 19 19	56. The method of claim 55, wherein said biomolecular interaction is further characterized in
	that it involves an anchor-adapter-tag unit, whereby said anchor is attached to the biomaterial
2 <sup>[]</sup>	architecture and wherein said tag is attached to the ligand, and said adapter is capable of binding
22	to both the anchor and the tag.
23	
24	57. The method of claim 66, wherein the anchor and tag independently comprise any
25	biologically relevant molecule capable of being incorporated into the biomaterial architecture and
26	the desired ligand, and wherein the adapter comprises any biologically relevant molecule capable
27	of binding to both the anchor and tag moieties to generate a biomolecular interaction.
28	

The method of claim 55, wherein said biomolecular interaction is characterized in that it 1 58. 2 involves an anchor-tag unit, whereby said anchor is attached to the homaterial architecture and said tag is attached to the ligand and wherein either the anchor or the tag is capable of effecting a 3 4 biomolecular interaction between the anchor and the tag. 5 The method of claim 58, wherein the anchor and tag comprise any biologically relevant 6 59. 7 molecule capable of being incorporated into the biomaterial architecture and the desired ligand, and wherein a biomolecular interaction is effected between the anchor and the tag. 8 9 The method of claim 55, wherein said biomaterial architecture comprises a biodegradable 10 60. 11 polymer. 12 The method of claim 56 or 58, wherein said anchor is incorporated into the polymer 61. during polymer synthesis. 62. The method of claim 61, wherein said polymer is PLA-PEG. The method of claim 55, wherein said therapeutic agent is selected from the group 63. consisting of anti-AIDS substances, anti-cancer substances, antibiotics, immunosuppressants, anti-viral substances, enzyme, inhibitors, neurotoxins, opioids, hypnotics, antihistamines, 21 lubricants, tranquilizers, anti-convulsants, muscle relaxants, anti-Parkinson's substances, antispasmodics, muscle contractants, miotics, anti-cholinergics, anti-glaucoma compounds, anti-22 23 parasite compounds, anti-protozoal compounds, anti-hypertensives, analgesics, anti-pyretics, anti-inflammatory agents, focal anesthetics, opthalmics, prostaglandins, anti-depressants, anti-24 psychotic substances, anti-emetics, imaging agents, specific targeting agents, neurotransmitters, 25 proteins, cell response modifiers, vaccines, ribozymes, anti-sense agents, cytokines, 26 27 immunotoxins, radiosensitizers, anti-edema agents, RNA, and combinations thereof. 28 May 19, 1999 Express Mail No.: EJ455653949US